UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

August 23, 2012

Mr. Lawrence J. Weber
Senior Vice President and
Chief Nuclear Officer
Indiana Michigan Power Company
Nuclear Generation Group
One Cook Place
Bridgman, MI 49106

SUBJECT: DONALD C. COOK NUCLEAR PLANT, UNIT 2 - ISSUANCE OF AMENDMENT RE: USE OF OPTIMIZED ZIRLO™ FUEL ROD CLADDING MATERIAL (TAC NO. ME7323)

Dear Mr. Weber:

The Nuclear Regulatory Commission has issued the enclosed Amendment No. 302 to Renewed Facility Operating License No. DPR-74 for the Donald C. Cook Nuclear Plant, Unit 2, in response to your application dated September 29, 2011, as supplemented on July 25, 2012.

The amendment revises Technical Specification (TS) 4.2.1, adding Optimized ZIRLO™ clad fuel rods to the fuel matrix in addition to Zircaloy or ZIRLO™ clad fuel rods that are currently in use. The amendment also adds a reference, a previously approved Westinghouse topical report regarding Optimized ZIRLO™ to Section 5.6.5, "Core Operating Limits Report (COLR)."

A copy of our related safety evaluation is also enclosed. A Notice of Issuance will be included in the Commission's next biweekly *Federal Register* notice.

Sincerely,

Peter S. Tam, Senior Project Manager
Plant Licensing Branch III-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-316

Enclosures:
1. Amendment No. 302 to DPR-74
2. Safety Evaluation

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

INDIANA MICHIGAN POWER COMPANY

DOCKET NO. 50-316

DONALD C. COOK NUCLEAR PLANT, UNIT 2

AMENDMENT TO RENEWED FACILITY OPERATING LICENSE

Amendment No. 302
License No. DPR-74

1. The U.S. Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment by Indiana Michigan Power Company (the licensee) dated September 29, 2011, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;

   B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;

   C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;

   D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and

   E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 2.C.(2) of Renewed Facility Operating License No. DPR-58 is hereby amended to read as follows:

   (2) Technical Specifications

   The Technical Specifications contained in Appendix A, and the Environmental Protection Plan contained in Appendix B, as revised through Amendment No. 302, are hereby incorporated into this license. The licensee shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

3. This license amendment is effective as of its date of issuance and shall be implemented within 60 days of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

Istvan Frankl, Acting Chief
Plant Licensing Branch III-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Attachment: Changes to the Renewed Facility Operating License and Technical Specifications

Date of Issuance: August 23, 2012

ATTACHMENT TO LICENSE AMENDMENT NO. 302

TO RENEWED FACILITY OPERATING LICENSE NO. DPR-74

DOCKET NO. 50-316

Replace the following page of Renewed Facility Operating License DPR-74 with the attached revised page. The revised page is identified by amendment number and contains a marginal line indicating the area of change.

REMOVE	INSERT
3	3

Replace the following pages of Appendix A, Technical Specifications, with the attached revised pages. The revised pages are identified by amendment number and contain a marginal line indicating the area of change.

REMOVE	INSERT
4.0-1	4.0-1
5.6-3	5.6-3
5.6-4	5.6-4
--	5.6-5

radiation monitoring equipment calibration, and as fission detectors in amounts as required.

(4) Pursuant to the Act and 10 CFR Parts 30, 40, and 70, to receive, possess and use in amounts as required any byproduct, source or special nuclear material without restriction to chemical or physical form, for sample analysis or instrument and equipment calibration or associated with radioactive apparatus or components; and

(5) Pursuant to the Act and 10 CFR Parts 30 and 70, to possess, but not separate, such byproduct and special nuclear materials as may be produced by the operation of the facility.

C. This renewed operating license shall be deemed to contain and is subject to the conditions specified in the following Commission regulations in 10 CFR Chapter I: Part 20, Section 30.34 of Part 30, Section 40.41 of Part 40, Section 50.54 and 50.59 of Part 50, and Section 70.32 of Part 70; and is subject to all applicable provisions of the Act and to the rules, regulations, and orders of the Commission now or hereafter in effect; and is subject to the additional conditions specified or incorporated below:

(1) Maximum Power Level

The licensee is authorized to operate the facility at steady state reactor core power levels not to exceed 3468 megawatts thermal in accordance with the conditions specified therein and in attachment 1 to the renewed operating license. The preoperational tests, startup and other items identified in Attachment 1 to this renewed operating license shall be completed. Attachment 1 is an integral part of this renewed operating license.

(2) Technical Specifications

The Technical Specifications contained in Appendix A, and the Environmental Protection Plan contained in Appendix B, as revised through Amendment No. 302, are hereby incorporated into this license. The licensee shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

(3) Additional Conditions

(a) Deleted by Amendment No. 76

(b) Deleted by Amendment No. 2

(c) Leak Testing of Emergency Core cooling System Valves

Indiana Michigan Power Company shall prior to completion of the first inservice testing interval test each of the two valves in series in the

4.0 DESIGN FEATURES

4.1 Site Location

4.1.1 Site and Exclusion Area Boundaries

The site area and exclusion area boundaries are as shown in Figure 4.1-1.

4.1.2 Low Population Zone

The low population zone is all the land within a circle centered on the reactor containment structures and a radius of 2 miles.

4.2 Reactor Core

4.2.1 Fuel Assemblies

The reactor shall contain 193 fuel assemblies. Each assembly shall consist of a matrix of Zircaloy or ZIRLO™, or Optimized ZIRLO™ fuel rods with an initial composition of natural or slightly enriched uranium dioxide (UO_2) as fuel material. Limited substitutions of zirconium alloy or stainless steel filler rods for fuel rods, in accordance with approved applications of fuel rod configurations, may be used. Fuel assemblies shall be limited to those fuel designs that have been analyzed with applicable NRC staff approved codes and methods and shown by tests or analyses to comply with all fuel safety design bases. A limited number of lead test assemblies that have not completed representative testing may be placed in nonlimiting core regions.

4.2.2 Control Rod Assemblies

The reactor core shall contain 53 full length control rod assemblies. The control material shall be silver indium cadmium, as approved by the NRC.

4.3 Fuel Storage

4.3.1 Criticality

4.3.1.1 The spent fuel storage racks are designed and shall be maintained with:

a. Fuel assemblies having a maximum nominal U-235 enrichment of 4.95 weight percent;

b. $k_{eff} \leq 0.95$ if fully flooded with unborated water, which includes an allowance for uncertainties as described in Section 9.7.2 of the UFSAR;

c. A nominal 8.97 inch center to center distance between fuel assemblies placed in the fuel storage racks;

5.6 Reporting Requirements

5.6.5 CORE OPERATING LIMITS REPORT (COLR) (continued)

5. LCO 3.1.6, "Control Bank Insertion Limits";

6. LCO 3.2.1, "Heat Flux Hot Channel Factor ($F_Q(Z)$)";

7. LCO 3.2.2, "Nuclear Enthalpy Rise Hot Channel Factor ($F^N_{\Delta H}$)";

8. LCO 3.2.3, "AXIAL FLUX DIFFERENCE (AFD)";

9. LCO 3.3.1, "Reactor Trip System (RTS) Instrumentation," Functions 6 and 7 (Overtemperature ΔT and Overpower ΔT, respectively) Allowable Value parameter values;

10. LCO 3.4.1, "RCS Pressure, Temperature, and Flow Departure from Nucleate Boiling (DNB) Limits"; and

11. LCO 3.9.1, "Boron Concentration."

b. The analytical methods used to determine the core operating limits shall be those previously reviewed and approved by the NRC, specifically those described in the following documents:

1. WCAP-9272-P-A, "Westinghouse Reload Safety Evaluation Methodology," (Westinghouse Proprietary);

2. WCAP-8385, "Power Distribution Control and Load Following Procedures - Topical Report," (Westinghouse Proprietary);

3. WCAP-10216-P-A, "Relaxation of Constant Axial Offset Control/F_Q Surveillance Technical Specification," (Westinghouse Proprietary);

4. Plant-specific adaptation (approved by Amendment 297, dated March 31, 2011) of WCAP-16009-P-A, "Realistic Large-Break LOCA Evaluation Methodology Using the Automated Statistical Treatment of Uncertainty Method (ASTRUM)," Revision 0 (Westinghouse Proprietary), approved by letter from H. N. Berkow, NRC, to J. A. Gresham, Westinghouse Electric Company, dated November 5, 2004;

5. WCAP-12610-P-A, "VANTAGE+ Fuel Assembly Reference Core Report," (Westinghouse Proprietary);

6. WCAP-8745-P-A, "Design Bases for the Thermal Overpower ΔT and Thermal Overtemperature ΔT Trip Functions," (Westinghouse Proprietary);

5.6 Reporting Requirements

5.6.5 CORE OPERATING LIMITS REPORT (COLR) (continued)

7. WCAP-13749-P-A, "Safety Evaluation Supporting the Conditional Exemption of the Most Negative EOL Moderator Temperature Coefficient Measurement," (Westinghouse Proprietary); and

8. WCAP-12610-P-A & CENPD-404-P-A, Addendum 1-A, "Optimized ZIRLO™," July 2006 (Westinghouse Proprietary).

c. The core operating limits shall be determined such that all applicable limits (e.g., fuel thermal mechanical limits, core thermal hydraulic limits, Emergency Core Cooling Systems (ECCS) limits, nuclear limits such as SDM, transient analysis limits, and accident analysis limits) of the safety analysis are met.

d. The COLR, including any midcycle revisions or supplements, shall be provided upon issuance for each reload cycle to the NRC.

5.6.6 Post Accident Monitoring Report

When a report is required by Condition B or G of LCO 3.3.3, "Post Accident Monitoring (PAM) Instrumentation," a report shall be submitted within the following 14 days. The report shall outline the preplanned alternate method of monitoring, the cause of the inoperability, and the plans and schedule for restoring the instrumentation channels of the Function to OPERABLE status.

5.6.7 Steam Generator Tube Inspection Report

A report shall be submitted within 180 days after the initial entry into MODE 4 following completion of an inspection performed in accordance with the Specification 5.5.7, Steam Generator (SG) Program. The report shall include:

a. The scope of inspections performed on each SG,

b. Active degradation mechanisms found,

c. Nondestructive examination techniques utilized for each degradation mechanism,

d. Location, orientation (if linear), and measured sizes (if available) of service induced indications,

e. Number of tubes plugged during the inspection outage for each active degradation mechanism,

f. Total number and percentage of tubes plugged to date, and

5.6 Reporting Requirements

g. The results of condition monitoring, including the results of tube pulls and in-situ testing.

UNITED STATES
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WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO

AMENDMENT NO. 302 TO RENEWED FACILITY OPERATING LICENSE NO. DPR-74

INDIANA MICHIGAN POWER COMPANY

DONALD C. COOK NUCLEAR PLANT, UNIT 2

DOCKET NO. 50-316

1.0 INTRODUCTION

By letter dated September 29, 2011 (Reference 1), as supplemented on July 25, 2012 (Reference 14), Indiana Michigan Power Company (I&M, the licensee), submitted a license amendment request (LAR) for Technical Specification (TS) revisions and exemption for Donald C. Cook Nuclear Plant (CNP), Unit 2 (References 1 and 14). The licensee proposed to change TS 4.2.1, "Fuel Assemblies," and TS 5.6.5, "Core Operating Limits Report (COLR)," to add Optimized ZIRLO™ as an acceptable fuel rod cladding material.

In the same September 29, 2011, letter the licensee also requested an exemption from the requirements of Title 10 of the *Code of Federal Regulation* (10 CFR) Part 50, Section 50.46, "Acceptance Criteria for Emergency Core Cooling Systems (ECCS) for Light-Water Nuclear Power Reactors," and Appendix K to 10 CFR Part 50, "ECCS Evaluation Models," to allow the use of fuel rods clad with Optimized ZIRLO™ alloy for future reload applications. The Nuclear Regulatory Commission (NRC) staff's review and actions on this exemption request is addressed by separate correspondence tracked under TAC No. ME7722.

The July 25, 2012, supplement contains clarifying information, does not change the scope of the application, and does not change the NRC staff's initial proposed finding of no significant hazards consideration published in the Federal Register on November 29, 2011 (76 FR 73731).

2.0 REGULATORY EVALUATION

The regulations in 10 CFR 50.90, "Application for Amendment of License or Construction Permit," allow a licensee to amend or change the original license application. The requirements at 10 CFR 50.92, "Issuance of Amendment," specify that the NRC staff will be guided by the considerations which govern the issuance of initial licenses to the extent applicable and appropriate in determining whether an amendment will be issued to the applicant. The licensee requests a license amendment to add Optimized ZIRLO™ as an acceptable fuel rod cladding material in the TS.

By letter dated June 10, 2005, the NRC staff issued a safety evaluation (SE) approving Addendum 1 to Westinghouse Topical Report (TR) WCAP-12610-P-A and CENPD-404-P-A, "Optimized ZIRLO™," wherein the NRC staff approved the use of Optimized ZIRLO™ as an acceptable fuel cladding material for Westinghouse and Combustion Engineering (CE) fuel

designs (References 2 and 3). The fuel rod burnup limits were approved to a peak rod average of 62 gigawatt-days per metric ton of uranium (GWD/MTU) for Westinghouse fuel and 60 GWD/MTU for Combustion Engineering fuel. The NRC staff approved the use of Optimized ZIRLO™ as a fuel cladding material based on:

1) similarities to standard ZIRLO™,
2) demonstrated material performance, and
3) a commitment to provide irradiated data and validate fuel performance models ahead of burnups achieved in batch application. The NRC staff's safety evaluation for Optimized ZIRLO™ includes 10 conditions and limitations for its use.

3.0 TECHNICAL EVALUATION

3.1 Conditions and Limitations

The June 10, 2005, SE (Reference 2) states:

> Based upon demonstrated material performance in addendum 1 and in response to RAIs [Requests for Additional Information]... and the irradiated database, the NRC staff has approved Optimized ZIRLO™ for full batch implementation.

The SE concludes:

> The NRC staff reviewed the effects of Optimized ZIRLO™ using the appropriate fuel design requirements of [Standard Review Plan] SRP 4.2 and 10 CFR Part 50, Appendix A, General Design Criteria and found that the TR provided reasonable assurance that under both normal and accident conditions, Westinghouse and CE fuel assembly designs implementing Optimized ZIRLO™ fuel cladding would be able to safely operate and comply with NRC regulations.

The SE also states that licensees referencing Addendum 1 to the TR to implement Optimized ZIRLO™ must ensure compliance with ten (10) issues as specified in the SE. The licensee has documented its compliance with these ten conditions and limitations in its September 29, 2011, application, as supplemented on July 25, 2012. Details of the compliance are as follows:

3.1.1 *Condition 1: Until rulemaking to 10 CFR Part 50 addressing Optimized ZIRLO™ has been completed, implementation of Optimized ZIRLO™ fuel clad requires an exemption from 10 CFR 50.46 and 10 CFR Part 50 Appendix K*

Enclosure 3 of the Licensee's September 29, 2011, submittal is the application for exemption. As stated above, the exemption request is addressed by separate correspondence.

3.1.2 *Condition 2: The fuel rod burnup limit for this approval remains at currently established limits: 62 GWD/MTU for Westinghouse fuel designs and 60 GWd/MTU for CE fuel designs.*

In its July 25, 2012, letter the licensee affirmed that the maximum fuel rod burnup limit for Optimized ZIRLO™ clad fuel will continue to be 62 GWD/MTU, and the mechanism to ensure that this limit is not exceeded is already in place in the CNP Unit 2 licensing basis.

3.1.3 *Condition 3: The maximum fuel rod waterside corrosion, as predicted by the best-estimate model, will be [proprietary limits included in topical report and proprietary version of safety evaluation] of hydrides for all locations of the fuel rod.*

The licensee stated that the maximum fuel rod corrosion using the Optimized ZIRLO™ cladding will be confirmed to meet the design limit as part of the core reload process. The NRC staff agrees that this condition is met by the licensee's stated action; since the core reload process is part of the current licensing basis, no additional requirement needs to be imposed.

3.1.4 *Condition 4: All the conditions listed in previous NRC SE approvals for methodologies used for standard ZIRLO™ and Zircaloy-4 fuel analysis will continue to be met, except that the use of Optimized ZIRLO™ cladding in addition to standard ZIRLO™ and Zircaloy-4 cladding is now approved.*

The licensee stated that the fuel analysis of Optimized ZIRLO™ fuel rod cladding will continue to meet all conditions associated with approved methods, as is required by the current core reload process. The NRC staff agrees that this condition is met by the licensee's stated action; since the core reload process is part of the current licensing basis, no additional requirement needs to be imposed.

3.1.5 *Condition 5: All methodologies will be used only within the range for which ZIRLO™ and Optimized ZIRLO™ data were acceptable and for which the verifications discussed in Addendum 1 and responses to RAIs [Requests for Additional Information] were performed.*

The licensee stated that the application of Optimized ZIRLO™ in approved methodologies will be made consistent with the approach accepted in WCAP-12610-P-A and CENPD-404-P-A, Addendum 1-A. dated July 2006, as is required by the current core reload process. The NRC staff agrees that this condition is met by the licensee's stated action; since the core reload process is part of the current licensing basis, no additional requirement needs to be imposed. .

3.1.6 *Condition 6: The licensee is required to ensure that Westinghouse has fulfilled the following commitment: Westinghouse shall provide the NRC staff with a letter(s) containing the following information (based on the schedule described in response to RAI #3):*

a. *Optimized ZIRLO™ LTA [Lead Test Assembly] data from Byron, Calvert Cliffs, Catawba, and Millstone.*

   i. Visual
   ii. Oxidation of fuel rods
   iii. Profilometry
   iv. Fuel rod length
   v. Fuel assembly length

b. *Using the standard and Optimized ZIRLO™ database including the most recent LTA data, confirm applicability with currently approved fuel performance models (e.g., measured vs. predicted).*

The licensee stated that Westinghouse has already provided the NRC staff a number of LTA data and models (References 4, 5, 6, 7, and 8). The data provided, but were not limited to, the information described in Condition 6a. LTA measured date and favorable results from visual examinations of once- and twice-burned LTAs confirm, for at least two cycles of operation, that the current fuel performance models are applicable for Optimized ZIRLO™ fuel rods. In its July 25, 2012, letter the licensee stated that it has a contractual agreement with Westinghouse, which requires that for each region of fuel, Westinghouse will provide verification that the cycle-specific parameters meet the applicable fuel rod design requirements. As higher burnups/fluencies are achieved for Optimized ZIRLO™ clad fuel rods, additional data would need to be sent to the NRC in order to support the contractually agreed-upon fuel rod design evaluations and verification for CNP Unit 2 reloads and confirm the applicability of Westinghouse approved methods with Optimized ZIRLO™ clad fuel rods. The NRC staff agrees that this condition is met by the licensee's contractual agreement with Westinghouse, and no additional requirement needs to be imposed.

3.1.7 *Condition 7: The licensee is required to ensure that Westinghouse has fulfilled the following commitment: Westinghouse shall provide the NRC staff with a letter containing the following information (based on the schedule described in response to RAI #11):*

a. Vogtle growth and creep data summary reports,

b. Using the standard ZIRLO™ and Optimized ZIRLO™ database including the most recent Vogtle data, confirm applicability with currently approved fuel performance models (e.g., level of conservatism in W [Westinghouse] rod pressure analysis, measured vs. predicted, predicted minus measured vs. tensile and compressive stress).

As stated before, Westinghouse has provided the NRC staff a number of LTA data and models including the Vogtle results. The data provided, but were not limited to, the information described in the Condition 7a.

The licensee indicated that the data from two cycles of operation had been evaluated and that the updated creep model had been used to predict the growth and creep in fuel rod performance. Westinghouse provided the results, which are favorable, to the NRC staff (Reference 8). The licensee stated that, as part of the current core reload process it will confirm that as higher burnups/fluencies are achieved for Optimized ZIRLO™ clad fuel rods, the requirements of this condition will continue to be met. Based on the review of Westinghouse's LTA references cited by the licensee, and the fact that the core reload process is part of the current licensing basis, the NRC staff considers that this condition is met by the licensee.

3.1.8 *Condition 8: The licensee shall account for the relative differences in unirradiated strength (YS [Yield Strength] and UTS [Ultimate Tensile Strength]) between Optimized ZIRLO™ and standard ZIRLO™ in cladding and structural analyses until irradiated data for Optimized ZIRLO™ have been collected and provided to the NRC staff.*

a. For the Westinghouse fuel design analyses:

i. The measured, unirradiated Optimized ZIRLO™ strengths shall be used for BOL analyses.

ii. *Between BOL up to a radiation fluence of 3.0 x 10^{21} n/cm^2 (E >1MeV), pseudo-irradiated Optimized ZIRLO™ strength set equal to linear interpolation between the following two strength level points: At zero fluence, strength of Optimized ZIRLO™ equal to measured strength of Optimized ZIRLO™ and at a fluence of 3.0 x 10^{21} n/cm^2 (E > 1MeV), irradiated strength of standard ZIRLO™ at the fluence of 3.0 x 10^{21} n/cm^2 (E > 1MeV) minus 3 ksi.*

iii. *During subsequent irradiation from 3.0 x 10^{21} n/cm^2 up to 12 x 10^{21} n/cm^2, the differences in strength (the difference at a fluence of 3 x 10^{21} n/cm^2 due to tin content) shall be decreased linearly such that the pseudo-irradiated Optimized ZIRLO™ strengths will saturate at the same properties as standard ZIRLO™ at 12 x 10^{21} n/cm^2.*

The licensee stated that the relative differences in unirradiated strength between Optimized ZIRLO™ and standard ZIRLO™ in cladding and structural analyses will be accounted for until irradiation data for Optimized ZIRLO™ is accepted by the NRC staff. The licensee also stated that analysis of Optimized ZIRLO™ clad fuel rods will use the yield strength (YS) and ultimate tensile strength (UTS) as modified per Conditions 8.a.i, 8.a.ii, and 8.a.iii until such time that irradiation data for Optimized ZIRLO™ strengths are collected and provided to the NRC. The licensee stated that as higher burnups/fluencies are achieved for Optimized ZIRLO™ clad fuel rods, it will ensure, as part of the licensing basis core reload process, that the requirements of this condition are met. The NRC staff agrees that this condition is met by the licensee's stated action; since the core reload process is part of the current licensing basis, no additional requirement needs to be imposed

3.1.9 *Condition 9: As discussed in response to RAI #21, for plants introducing Optimized ZIRLO™ that are licensed with LOCBART or STRIKIN-II and have a limiting PCT that occurs during blowdown or early reflood, the limiting LOCBART or STRIKIN-II calculation will be rerun using the specified Optimized ZIRLO™ material properties. Although not a condition of approval, the NRC staff strongly recommends that, for future evaluations, Westinghouse updates all computer models with Optimized ZIRLO™ specific material properties.*

The licensee stated that the Donald C. Cook Unit 2 is not licensed with LOCBART or STRIKIN-II loss-of-coolant accident methodology. Therefore, this condition does not apply to Donald C. Cook Unit 2. The NRC staff agrees with this statement.

3.1.10 Condition 10: *Due to the absence of high temperature oxidation data for Optimized ZIRLO™, the Westinghouse coolability limit on PCT during the locked rotor event shall be [proprietary limits included in topical report and proprietary version of safety evaluation].*

The licensee stated that the locked rotor event will be assessed against this coolability limit for the Optimized ZIRLO™ fuel design as part of the core reload design process. The NRC staff agrees that this condition is met by the licensee's stated action; since the core reload process is part of the current licensing basis, no additional requirement needs to be imposed.

Based upon the information reviewed above, the NRC staff finds that the licensee's application meets the requirements of all 10 SE conditions and limitations. Therefore, the NRC staff concludes that the Optimized ZIRLO™ fuel design is acceptable for use in CNP, Unit 2 to a peak rod average burnup limit of 62 GWD/MTU.

3.2 Technical Specifications (TS) Revisions

3.2.1 TS Section 4.2.1, "Fuel Assemblies"

The licensee proposed to add Optimized ZIRLO™ as an acceptable fuel rod cladding material and correct the spelling of Zircaloy in the CNP Unit 2 TSs. The new sentence is stated as follows:

> "...Each assembly shall consist of a matrix of Zircaloy, ZIRLO™, or Optimized ZIRLO™ fuel rods..."

Based on the fact that Optimized ZIRLO™ fuel was previously approved and that the licensee had specifically addressed the 10 conditions and limitations delineated in the approved topical report (see Section 3.1 above), the NRC staff concludes that this revision is acceptable.

3.2.2 Section 5.6.5, "Core Operating Limits Report (COLR)"

The licensee proposed to add the approved Westinghouse topical report, WCAP-12610-P-A and CENPD-404-P-A, Addendum 1-A, "Optimized ZIRLO™," dated July 2006 to the list of references for the COLR. Based on the fact that the subject report was previously approved, the NRC staff concludes that this revision is acceptable.

3.3 Thermal Conductivity Degradation

This section briefly describes the development of the issue of thermal conductivity degradation (TCD) of reactor fuel. The sole purpose is to document the fact that the NRC staff is aware of TDC while reviewing the licensee's application to use Optimized ZIRLO™ clad fuel, and has determined that the issue of TDC does not prevent the NRC staff from concluding that Optimized ZIRLO™ clad fuel can be approved for use at CNP Unit 2.

On October 8, 2009, the NRC staff issued an information notice (IN) 2009-23, "Nuclear Fuel Thermal Conductivity Degradation" (Reference 9). Fuel thermal conductivity degradation is a physical phenomenon due to irradiation damage and the progressive buildup of fission products in fuel pellets resulting in reduced thermal conductivity of the pellets. However, thermal performance codes approved by NRC before 1999 did not necessarily include this reduction in thermal conductivity with increasing irradiation.

On December 13, 2011, the NRC staff issued IN 2011-21, "Realistic Emergency Core Cooling System Evaluation Model Effects Resulting from Nuclear Fuel Thermal Conductivity Degradation" (Reference 10). The IN intended to notify licensees of recent information obtained concerning the impact of fuel thermal conductivity degradation, and its potential to cause errors in realistic ECCS evaluation models.

By letter dated February 16, 2012, the NRC staff issued a letter in accordance with 10 CFR 50.54(f) (Reference 11). Pursuant to this regulation, the NRC staff requested that the licensee provide further information regarding the effect of a potentially significant error, as defined in 10 CFR 50.46(a)(3)(i), associated with thermal conductivity degradation, on peak cladding temperature in the Westinghouse-furnished realistic ECCS evaluation models. The requested information would enable the NRC staff to determine compliance with the CNP, Units 1 and 2, licensing basis, which includes the requirements of 10 CFR 50.46(a)(3)(ii), concerning the reporting of errors and changes to the ECCS evaluation model.

By letter dated March 19, 2012, the licensee submitted a response to the 10 CFR 50.54(f) information request (Reference 12). The NRC staff reviewed the submitted information and determined that the licensee provided the information required to be responsive to the issues discussed above. In addition, the NRC staff determined that the response, which included a report pursuant to 10 CFR 50.46(a)(3)(ii), demonstrated that the licensee has complied with the applicable reporting requirements. Therefore, the NRC staff concluded that the action under 10 CFR 50.54(f) is closed (Reference 13).

However, after reviewing of the 10 CFR 50.46(a)(3)(ii) report, the NRC staff determined that additional information will be required to verify the adequacy of the ECCS evaluation model. Therefore, while the information provided pursuant to 10 CFR 50.54(f) enabled the NRC staff to close this action, the NRC staff has initiated separate actions to continue its review under the auspices of 10 CFR 50.46 for CNP, Units 1 and 2 (Reference 13). In addition, the NRC staff determined that the TDC issue does not affect the proposed amendment regarding using the Optimized ZIRLO™ clad fuel rods.

3.4 Exemption to Regulations

As explained in Section 2.0 above, the regulations in 10 CFR 50.46, "Acceptance Criteria for Emergency Core Cooling Systems for Light-Water Nuclear Power Reactors," and 10 CFR Part 50, Appendix K, "ECCS Evaluation Models," make no provisions for use of fuel rods clad in a material other than Zircaloy or ZIRLO™. Since the material specifications of Optimized ZIRLO™ differ from the specification for Zircaloy or ZIRLO™, a plant-specific exemption is needed to permit Amendment No. 302, which this SE supports, to be effective. The exemption is issued separately from, but concurrently with this SE and Amendment No. 302.

3.5 Summary of Technical Evaluation

The NRC staff has reviewed the licensee's proposed amendment of the TS. Based on the evaluation set forth above, the NRC staff concludes that the Optimized ZIRLO™ fuel design is acceptable for CNP-2 to a peak rod average burnup limit of 62,000 MWD/MTU, and the associated TS revisions are acceptable.

4.0 STATE CONSULTATION

In accordance with the Commission's regulations, the Michigan State official was notified of the proposed issuance of the amendments. The State official had no comments.

5.0 ENVIRONMENTAL CONSIDERATION

NRC's requirements at 10 CFR §51.21 provides that all licensing and regulatory actions require an environmental assessment except those identified in §51.20(b) as requiring an environmental impact statement, those identified in §51.22(c) as categorical exclusions, and those identified in §51.22(d) as other actions not requiring environmental review. Accordingly, the NRC staff published an environmental assessment on August 23, 2012 (77 FR 51071) for the subject amendment. Among other things, this environmental assessment updated the CNP-2 environmental record to accommodate an extended fuel burnup limit of 62 GWD/MTU.

6.0 CONCLUSION

The Commission has concluded, based on the considerations discussed above, that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by

operation in the proposed manner, (2) there is reasonable assurance that such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

7.0 REFERENCES

1. Letter from Indiana Michigan Power Company to NRC, "License Amendment Request for Unit 2 Use of Optimized ZIRLO™ Fuel Rod Cladding," September 29, 2011, Agencywide Documents Access and Management System (ADAMS) Accession No. ML11286A198.

2. Letter from H. N. Berkow, NRC, to J. A. Gresham, Westinghouse Electric Company, "Final Safety Evaluation for Addendum 1 to Topical Report WCAP-12610-P-A and CENPD-404-P-A, 'Optimized ZIRLO™,'" June 10, 2005, ADAMS Accession No. ML051670395.

3. WCAP-12610-P-A and CENPD-404-P-A, Addendum 1-A, "Optimized ZIRLO™," July 2006, ADAMS Accession No. ML062080576.

4. Letter from Westinghouse to NRC, "SER Compliance with WCAP-12610-P-A & CENPD-404-P-A, Addendum 1-A 'Optimized ZIRLO™, (Proprietary)" LTR-NRC-07-1, January 4, 2007, ADAMS Accession No. ML070100389.

5. Letter from Westinghouse to NRC, "SER Compliance with WCAP-12610-P-A & CENPD-404-P-A Addendum 1-A 'Optimized ZIRLO™'(Proprietary)'" LTR-NRC-07-58, November 6, 2007, ADAMS Accession No. ML073130562.

6. Letter from Westinghouse to NRC, "SER Compliance with WCAP-12610-P-A & CENPD-404-P-A Addendum 1-A 'Optimized ZIRLO™'" (Non-Proprietary), LTR-NRC-07-58, Rev. 1, February 5, 2008, ADAMS Accession No. ML080390452.

7. Letter from Westinghouse to U.S. Nuclear Regulatory Commission, "SER Compliance of WCAP-12610-P-A & CENPD-404-P-A Addendum 1-A 'Optimized ZIRLO™'" (Proprietary/Non-Proprietary), LTR-NRC-08-60, December 30, 2008, ADAMS Accession No. ML090080380.

8. Letter and documents from Westinghouse to U.S. Nuclear Regulatory Commission, "SER Compliance of WCAP-12610-P-A & CENPD-404-P-A Addendum 1-A 'Optimized ZIRLO™'" (Proprietary/Non-Proprietary), LTR-NRC-10-43, July 26, 2010, ADAMS Accession No. ML102140223.

9. Information Notice 2009-23, "Nuclear Fuel Thermal Conductivity Degradation," October 8, 2009, ADAMS Accession No. ML091550527.

10. Information Notice 2011-21, "Realistic Emergency Core Cooling System Evaluation Model Effects Resulting from Nuclear Fuel Thermal Conductivity Degradation," December 13, 2011, ADAMS Accession No. ML113430785.

11. Letter from Michele G. Evans, NRC, to Lawrence J. Weber, Indiana Michigan Power Company, "Donald C. Cook Nuclear Plant, Units 1 and 2 – Information Request Pursuant to 10 CFR 50.54(f) Related to the Estimated Effect on Peak Cladding Temperature Resulting from Thermal Conductivity Degradation in the Westinghouse-Furnished Realistic Emergency Core Cooling System Evaluation," February 16, 2012, ADAMS Accession No. ML12041A384.

12. Letter from Joel P. Gebbie, Indiana Michigan Power Company, to NRC, "Response to Information Request Pursuant to 10 CFR 50.54(f) Related to the Estimated Effect on Peak Cladding Temperature Resulting from Thermal Conductivity Degradation in the Westinghouse-Furnished Realistic Emergency Core Cooling System Evaluation," March 19, 2012, ADAMS Accession No. ML12088A104.

13. Letter from Peter S. Tam, NRC, to Lawrence J. Weber, Indiana Michigan Power Company, "D. C. Cook Nuclear Plant (DCCNP), Units 1 and 2 – Closeout of Information Request Pursuant to 10 CFR 50.54(f) Related to the Estimated Effect on Peak Cladding Temperature Resulting from Thermal Conductivity Degradation in the Westinghouse-Furnished Realistic Emergency Core Cooling System Evaluation," April 2, 2012, ADAMS Accession No. ML12088A376.

14. Letter from Indiana Michigan Power Company to NRC, "Response to Request for Additional Information Regarding the License Amendment Request for Use of Optimized ZIRLO™ Fuel Rod Cladding," July 25, 2012,

Principal Contributor: Shih-Liang Wu, NRR

Date: August 23, 2012

August 23, 2012

Mr. Lawrence J. Weber
Senior Vice President and
Chief Nuclear Officer
Indiana Michigan Power Company
Nuclear Generation Group
One Cook Place
Bridgman, MI 49106

SUBJECT: DONALD C. COOK NUCLEAR PLANT, UNIT 2 - ISSUANCE OF AMENDMENT RE: USE OF OPTIMIZED ZIRLO™ FUEL ROD CLADDING MATERIAL (TAC NO. ME7323)

Dear Mr. Weber:

The Nuclear Regulatory Commission has issued the enclosed Amendment No. 302 to Renewed Facility Operating License No. DPR-74 for the Donald C. Cook Nuclear Plant, Unit 2, in response to your application dated September 29, 2011, as supplemented on July 25, 2012.

The amendment revises Technical Specification (TS) 4.2.1, adding Optimized ZIRLO™ clad fuel rods to the fuel matrix in addition to Zircaloy or ZIRLO™ clad fuel rods that are currently in use. The amendment also adds a reference, a previously approved Westinghouse topical report regarding Optimized ZIRLO™ to Section 5.6.5, "Core Operating Limits Report (COLR)."

A copy of our related safety evaluation is also enclosed. A Notice of Issuance will be included in the Commission's next biweekly *Federal Register* notice.

Sincerely,
/RA/

Peter S. Tam, Senior Project Manager
Plant Licensing Branch III-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-316

Enclosures:
1. Amendment No. 302 to DPR-74
2. Safety Evaluation

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*Safety evaluation transmitted by memo of 5/8/12 (Accession No. ML12128A391).

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